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ABSTRACT

The effect of the Feingold diet (elimination of artificial colors, flavors, or foods with natural salicylates to reduce hyperactivity) on the reading achievement scores, behavior, and impulsivity/reflectivity of 13 children (ages 6 to 12 years) was evaluated. Six months after the experimental group adopted the Feingold diet there were no significant differences between the experimental and control groups on the standardized reading tests or on any of the five factors of the Conners Teacher Rating Scale (a measure of classroom behavior). Results on the Matching Familiar Figures Test showed possible changes in the impulsivity/reflectivity dimension as a function of the diet. Eight mothers reported marked behavioral improvement, six of the Ss followed the diet for at least 5 months, but seven mothers claimed the diet was too difficult to implement and had discontinued it after 1 or 2 months. (DB)

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Feingold diet effect on reading achievement and classroom behavior

Various therapeutic approaches have been attempted to solve reading problems, namely: tutoring sessions, psycho-therapy, behavior modification, and drug therapy. Some youngsters encountered success but others exhibited minimal progress. Often a reading disability is accompanied by a behavioral problem at home and/or at school. Parents report acting-out behavior such as fighting with peers in a sadistic fashion; teachers report disruptive behavior in the classroom, or an inability to attend to a task for a stipulated period of time, etc. For some children, the remediation of reading and/or behavioral problems appears to resist alleviation by conventional methods. Recently, some parents began to initiate a different remedial approach; nutritional therapy.

Nutrition, as a source of therapy for youngsters with learning and/or behavior problems, was a controversial subject studied by both the medical community and researchers in the behavioral sciences. Recent biochemical studies attempted to relate the influence of nutrients to learning and behavior.

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Brain development, most critical for the growth and development of the individual, occurs from the moment of conception to about six months after birth, at which time brain cell size increases until about age two. A critical period exists during those first early months after birth when cell division occurs rapidly and myelination proceeds at a rapid rate. Proper nutrition is essential for these processes to succeed. Longitudinal studies by Chase and Martin (1970) and Cravioto and De Licardie (1968) indicated children, who were previously malnourished at an early age, evidenced significantly lower performance levels than their siblings years later on tests of auditory-visual and visual-kinesthetic integration with language ability the slowest area to overcome initial developmental lag. Severely starved infants who suffered from a digestive disorder, pyloric stenosis, were found to be consistently lower on tests of auditory memory and social maturity as compared to matched controls 5 years and 14 years later. (Klein, Forbes, Nader 1975). The onset of starvation between 21 and 30 days of age was significantly related to school problems, immaturity, and hyperactivity.

Vitamins are essential nutrients for the cellular metabolism of the brain. Certain vitamins are particularly important to central nervous system activity. Valentiner (1943) found the addition of vitamin B complex for mentally retarded youngsters increased their accuracy

and general level of accomplishment in addition to consistency of performance as contrasted to a control group. Pauling (1969) believed significant improvement in mental health was achieved by added concentrations of vitamin B complex and vitamin C since an individual's diet, or metabolic functioning, may be insufficient in these substances. Rimland (1973) found mentally ill children and adults tended to have markedly atypical vitamin metabolism. Cott (1972) reported favorable results after treating five-hundred schizophrenic children with a megavitamin approach. His work, however, was not studied under controlled conditions.

The brain becomes active in the presence of certain stimuli for some individuals. (Moyers 1975). Some adults and children reacted adversely to the additive monosodium glutamate. When the flavor enhancer was removed from the diet none of the previously reported negative episodes occurred during a three year follow-up period. (Reif-Lehrer and Stemmerman 1975). Allergies affect the central nervous system directly. Allergic reactions result in skin irritations for some, while for others inborn neural connections are activated by particular substances, including nutrients, which precipitate behavioral responses. Allergies may be genetically inherited and may change from one stage of life to another. The manipulation of diet and appropriate supplements may assist in the management of allergy. (Wunderlich 1978).

A parallel handicap for children with learning problems is one

that is dominant in the home as well as the classroom: hyperactivity. Hyperactivity may be defined as a symptom characterized by increased purposeless physical activity and a significantly impaired span of focused attention. (Feingold 1976). Intrinsic causative factors may have originated in events taking place before birth, during the birth process, or related to early infection or injury. Chemical imbalance in the brain may produce hyperactivity. (Marceca 1978). In some instances metabolic patterns differ substantially from individual to individual and may increase the susceptibility of a particular individual to an excess of one factor or a deficiency of another.

Nutritional factors may directly influence behavior by their quantity in the diet, or by their availability, in response to the body's demand under various circumstances of daily activity. Some individuals may have an abnormally high requirement for certain vitamins. The availability of nutrients may directly influence behavior, and ultimately, the ability to learn. The mechanism for this process is not clearly understood. (Feingold 1976).

Feingold, an allergist, hypothesized that food additives may be part of a group of pollutants that contributed to hyeractivity. Chemical compounds, natural or synthetic, may have produced an adverse effect for some members of the population. Some individuals were sensitive to salicylates found in certain foods, tartrazine found in dyes, or indo-

methacin which some individuals cannot tolerate. Feingold claimed that studies in genetics demonstrated a "pharmacological individuality." Behavioral disturbances may be a result of neurological damage which occurred during gestation by noxious substances. "Developing organs are very susceptible to damage from chemicals and from radiation." (Feingold 1976). The mechanism that caused the intolerance was not completely understood, though it was not considered an allergy.

Feingold recommended an elimination diet free from added artificial colors, flavors, or foods with natural salicylates. He found two groups of individuals who were affected by artificial colors and flavors: a primary and a secondary group. The primary group responded dramatically to the elimination diet by a complete reversal of behavioral patterns. In the secondary group the disturbance caused by the additives appeared superimposed upon underlying pathology or physiological disturbance. A third group failed to respond to the diet completely.

Feingold explained that molecules from any environmental compound may be toxic to the fetus. During cell differentiation, especially, the fetus would be highly susceptible to insult. Any disturbances caused by nervous system change may not be observable at birth but may appear at a later time as a behavioral disturbance or learning disability. Food additives may serve as irritants superimposed upon other causes of neurologic damage. The toxicant may be ingested

by the mother during pregnancy or by the individual after birth. If exposure to the chemical irritant occurred over a period of years, irreversible damage may ensue, which may explain behavioral improvement for some or concommittant incoordination and/or learning problems for others. The higher association centers are the last to differentiate and are, therefore, most susceptible to neurotoxins. These centers are not fully formed at birth and may be centers for insult which result in the hyperkinetic syndrome.

Feingold reported a favorable response to his elimination diet for 30 to 70 percent of children he observed in his clinic. Deficits associated with hyperactivity were not observable in all children and patterns of activity varied. Younger children made a more rapid positive response to the diet than older children. Unfortunately, his findings were reported only in case histories rather than in controlled studies.

In a controlled study of 15 hyperactive children by Conners (1976) during a four-week trial, teachers, unaware of diet manipulation, perceived reduced hyperactivity. Two double-blind challenge trials by Conners using artificial food dyes indicated impaired attention and visual motor tracking after a challenge cookie was ingested.

When 58 percent of a group of hyperactive children who failed to respond to behavior modification techniques indicated a positive response to artificial colors, flavors, and salicylates they were placed

on the Feingold diet. (Salzman 1976). Results indicated 93 percent indicated positive improved behavior four weeks later as perceived by parents. In a double-blind crossover study of the Feingold diet (Harley and others 1978) no significant changes occurred during classroom observations or by parents. However, improved behavior was noted among the pre-school group, which supported Feingold's contention that younger children did manifest faster, more positive reaction to the elimination diet. A subsequent study revealed 70 percent of hyperactive children presented positive allergy reactions as compared to only 15 to 20 percent for the population at large. (Rapp 1978). An eighteen month follow-up study of the same children who remained on the elimination diet indicated that for those who showed no change after one week, behavior improved with time.

Nutritional effects on learning and behavior may be indicated not only quantitatively but qualitatively. For some children the inability to utilize specific nutrients or to absorb some of the chemicals found in today's foodstuff may result in behavior which is not conducive to optimum learning. A study of the effect of the Feingold diet on reading achievement and classroom behavior appeared indicated.

Exploratory study

The researcher attended meetings of the Feingold Association

where mothers were instructed on the implementation of the Feingold diet for their children. Mothers volunteered their children for study by the researcher. The study consisted of thirteen children, ages 6 to 12, whose diet was about to be changed and six subjects identified by classroom teachers who served as controls for six of the Feingold subjects. All subjects lived on Long Island.

The researcher met the experimental subjects and their mothers in their homes, and the control subjects in their schools. The following hypotheses were tested:

(1) For children placed on the Feingold elimination diet there would be a significant gain in reading achievement over their predicted reading achievement scores based upon their historical rate of gain.

(2) There will be a significant change in behavior as measured by the Conners Teacher Rating Scale, for learning capacity, for children who have been on the Feingold diet for six months as measured with a related means t-test.

(3) There will be a significant change on the Matching Familiar Figures Test, with an implication of impulsivity or reflectivity, by subjects who have been on the Feingold diet for six months.

(4A) There will be a significant relationship between the change in a student's score on the number of errors made on a test of

impulsivity-reflectivity and the change in reading achievement.

(4B) There will be a significant relationship between the change of a student's score on latency on a test of impulsivity-reflectivity and the change in reading achievement.

During the prearranged meetings the nineteen subjects were examined with the following instruments: Gates-MacGinitie Reading Tests to ascertain grade level; Wide Range Achievement Test - reading sub-test, to confirm grade level scores; Matching Familiar Figures Test to determine personality traits of impulsivity or reflectivity. Classroom teachers completed the Conners Teacher Rating Scale to determine five factors of classroom behavior: aggression, inattentiveness, anxiety, hyperactivity, and sociability. Mothers supplied case history information about each child during taped interviews.

Prior to the implementation of the diet six experimental subjects were compared to matched controls with the independent means t-test on the reading tests and the teacher's behavioral checklist. There was no significant difference between the experimental and control groups prior to the implementation of the diet. In order to determine personality trait changes the MFFT was administered. The scores on this test indicate the number of errors made and the amount of time needed to accurately note a precise match to a familiar figure. The results indicated a significant difference between the groups on the number of

errors made, and no significant difference between the groups on the latency aspect, prior to dietary change.

Six months after the experimental group adopted the Feingold diet there was no significant difference between the experimental and control groups on the standardized reading tests or on any of the five factors of the Conners Teacher Rating Scale. Results on the MFFT indicated no difference on errors or latency between the two groups. Since pre-Feingold diet results on the MFFT indicated significant differences between the experimental and control groups on the errors portion, it was concluded that one aspect of personality changed during the six month interval.

A t-test analysis was employed to test the hypotheses of the study and significance was sought at the .05 level of confidence. The results on the Gates-MacGinitie Reading Test and the WRAT indicated no significant difference six months after the Feingold diet was implemented. Teachers noted no significant change on any of the five behavioral factors. Hypotheses 1 and 2 were rejected. There was no significant difference noted on the errors portion of the MFFT, though there was a significant difference by experimental subjects on the latency aspect. Experimental subjects appeared to have improved in their ability to concentrate. Hypothesis 3 was accepted. The Pearson Product Moment Correlation was calculated to note the relationship between a

change in impulsivity-reflectivity and the change in reading achievement. The results indicated a low positive degree of relationship between change in impulsivity and change in reflectivity compared to change in reading grade level scores, but these results failed to arrive at significance. Change in personality did not appear to have a significant correlation with changes on scores of standardized reading tests. Hypotheses 4A and 4B were rejected.

Mothers supplied background information prior to dietary change pertaining to the child's medical history, allergy susceptibility, and recourse to other therapies. Six months after the diet change, mothers reported about the child's behavioral changes in the home, the actual time her child followed the Feingold diet, ease of diet implementation, and the projected adherence to the diet in the future. Of the thirteen children who started the diet, seven were products of pre or perinatal complications, six suffered from medical problems such as pyloric stenosis, six had a history of allergy, and six had sought aid from other disciplines. After the diet change eight mothers reported marked behavioral improvement. Six subjects followed the diet for at least five months, but seven mothers claimed it was too difficult to implement and had discontinued it after one or two months. Five mothers admitted they did not plan to follow the diet in the future either because it was too time consuming or they failed to note sufficient progress. The

other eight mothers indicated a heightened awareness of nutrients and would attempt to follow the diet most of the time. One mother reported, "In the beginning when I found it a burden I said to myself, 'if he were crippled, or blind, or mentally retarded, I'd go to the ends of the earth on my hands and knees to make him better.' All I have to do is cook. I shop a little more, I cook a little more, that's nothing! Now I have a normal child."

Summary

This study was initiated for the purpose of investigating change in dietary patterns, as formulated by Dr. Ben F. Feingold, and its effect on children's emotional behavior and academic achievement. Programs of intervention for academic or behavior improvement usually neglected nutrition. While educators were cognizant of the role of inter-sensory integration for the sensori-motor skills, forerunners of cognitive and language development, the critical role of nutrition was usually omitted.

The conclusion of the study was that reading achievement and classroom behavior was not significantly different after dietary change. There was a significant change in personality. These personality changes, when correlated with reading scores, indicated a low positive relationship. Parents of children who adhered to the diet more rigorously claim-

ed their children demonstrated more positive behavioral changes in the home and an improved attitude towards school. Better home relationships may very well be a forerunner to improved school behavior, and ultimately, learning, albeit a placebo effect may very well be at work.

Mothers assumed the primary responsibility for seeking aid for their children's problems. The father's role appeared to be non-existent, though in two cases it was reported they were the first to note behavioral change in the home. The burden of attendance at Feingold Association meetings, the locating of specific foodstuffs, and the monitoring of the diet were all assumed by mothers.

Some youngsters learned to become more responsible for their own intake and indicated a satisfaction in being able to influence their own therapy.

Limitations

This study was hampered by an inability to monitor the food intake of the subjects at home and at school. Mothers' recall of background information may have been limited. Reporting by mothers and teachers may have been subjective.

Recommendations

Complete reliable testing of the efficacy of the Feingold diet

may best be controlled in an institutional setting. Further study of the relationship of children who demonstrate allergic response to colors and flavors, and reading achievement or behavioral problems, is recommended. Additional study of personality change as related to the Feingold diet is also indicated. The Feingold diet does not appear to hinder traditional reading therapy and may very well be recommended to augment it.